

Pratyay Chowdhury

Integrated BS-MS in Physics

Personal Details

Name	Pratyay Chowdhury
Gender	Male
Date of Birth	2nd March, 2002
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University Details

Name	Indian Association for the Cultivation of Science (IACS)
Address	2A & 2B, Raja Subodh Chandra Mallick Road, Jadavpur, Kolkata, West Bengal, India, Postal Code - 700032.
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Education

2018	Passed WBBSE Class X from Siliguri Boys' High School, Siliguri, Darjeeling <i>Board 91%</i>
2020	Passed WBCHSE Class XII from Siliguri Boys' High School, Siliguri, Darjeeling <i>Board 89%</i>
2020 - Present	Integrated BS-MS in Physics from IACS Kolkata, India <i>CGPA 7.8</i>

Conferences and Workshops

July'24	V Summer International School on Gravity, Cosmology and Astrophysics (ISGCA-2024), Moscow, Russia <i>The main goals of the School were to discuss modern accomplishments in studying the Universe, tackle the main problems, share ideas and methods of research in the theory of gravity and cosmology.</i>
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Projects and Work Experience

Dec'24 - Present	Numerical simulations of star-disk and star-planet magnetospheric interaction <i>Under the supervision of Dr. Miljenko Cemeljic, CAMK, Poland</i> <ul style="list-style-type: none">Undertaken as an external project.We were offered an introduction to numerical simulations with the state-of-the-art code PLUTO. Star-disk simulations will investigate the jet launching from a thin accretion disk. Star-planet simulations will investigate the radio emission from auroras on planets around pulsars.
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Jun'24 - Present	<p>Analytical vs numerical solutions in magnetohydrodynamics</p> <p><i>Under the supervision of Dr. Tomasz Krajewski, CAMK, Poland</i></p> <ul style="list-style-type: none"> • Undertaken as summer project. • Magnetohydrodynamics is broadly used to describe many astrophysical objects, for example, accretion disk around black holes or neutron stars. Even though some analytic solutions of equations of magnetohydrodynamics exist, there are very rare and correspond to highly symmetric settings, usually equivalent to low dimensional problems. As a example, we can mention: Sod shock tube problem, propagation of smooth Alfven waves, Taylor–von Neumann–Sedov blast waves and so called (1-2-0-3) problem. Modeling realistic systems requires usage of numerical methods to obtain some approximations of exact solutions. The aim of this project is to compare numerically obtained results with analytical ones for problems in which the later are known. Understanding the imperfection of various numerical schemes will be helpful in deciding which one should be used for studying astrophysical phenomena and help to develop the new more precise or robust one. Moreover, calculating numerical solutions of standard one-dimensional problems are an important test for correctness of implementation of numerical code extensively used in the past. Finally, knowledge of analytical solution gives rare occasions to evaluate effectiveness of so called a posteriori error estimator used to estimate the quality of numerical solutions and are a necessary ingredient of algorithms based on advanced methods of adaptive mesh refinement.
Oct'23 - Present	<p>Simulation study of water cherenkov detector used in detecting solar neutrinos</p> <p><i>Under the supervision of Dr. Sunanda Banerjee, IACS Kolkata, India.</i></p> <ul style="list-style-type: none"> • Undertaken as my master's project.[Report] • This project presents a comprehensive simulation study focusing on the Water Cherenkov Detector (WCD) and its application in detecting solar neutrinos. Neutrinos, fundamental particles emitted by the sun, provide critical insights into solar processes and astrophysics. The WCD, designed to exploit the Cherenkov radiation produced by charged particles in water, serves as a promising tool for neutrino detection, as neutrino has a very low interaction probability with other particles. Utilizing an advanced simulation toolkit named GEANT4, this study models the interaction of neutrinos with water and simulates the response of the WCD. Key parameters such as detection efficiency, background noise, energy resolution, and directional sensitivity are thoroughly investigated and analyzed. little.
Jan'24 - End of March'24	<p>AI based labelling of SUIT data</p> <p><i>IUCAA Solar Physics Group</i></p> <ul style="list-style-type: none"> • The details of this project can not be shared as it contains classified information. • It is a great honor to be a part of India's first solar mission, Aditya-L1.
Oct'21 - Jan'22	<p>Non-linearity and chaos in a rabbit population</p> <p><i>Under the supervision of Dr. Jayanta K Bhattacharya, IACS Kolkata, India.</i></p> <ul style="list-style-type: none"> • Undertaken as a project, parallel to course studies. • We modelled the rabbit population using the logistic map and studied the logistic mapping with the nonlinearity parameter varied through one to four. Different values of this variable offer an enhanced possibility for the stabilization of periodic dynamics. A study of the system as a function of nonlinearity reveals new phenomena: In addition to period-doubling and tangent bifurcations, there can be bifurcations where the period increases by unity. Also, we have seen the birth of chaos when the parameter related to the rate of reproduction of rabbits goes to 4 or above.

Jun'20	International Asteroid Search Campaign <i>International Astronomical Search Collaboration (IASC)</i> <ul style="list-style-type: none"> Undertaken as a side hustle during COVID-19. This was a citizen science program that provided high-quality astronomical data to citizen scientists around the world. There, I discovered an asteroid (2020 JK11), which is now enlisted in MPC's database. I used a software named Astrometrica (Astrometrica provides the ability to easily compare astronomical images to move object detection) to process the images given by the PAN-STARRS observatory.
For some time in winter of 2022	Mathematical aspects of quantum mechanics <i>Under the supervision of Dr. Kaushik Ray, IACS Kolkata, India.</i> <ul style="list-style-type: none"> Undertaken as a reading project. To get a comprehensive treatment of quantum mechanics from a mathematics perspective. In addition to traditional topics, like classical mechanics, mathematical foundations of quantum mechanics, quantization, and the Schrodinger equation, I have got a mathematical treatment of systems of identical particles with spin.
During Aug'17	Detecting the Perseid meteor shower using hand-made radio telescopes <i>Under the supervision of senior members of Sky Watchers Association of North Bengal</i> <ul style="list-style-type: none"> The idea was to indirectly capture the event of Perseid Meteor Shower during the heavy rain in North Bengal. The members of the Sky Watchers Association of North Bengal, which I am a part of, made a bunch of 'yagi antennae' using household materials. We went away from the city, outside the range of city radio stations. When meteorites enter the atmosphere, they burn and ionize the air around it, the air then becomes opaque to long-wavelength radio waves. Using this phenomenon, we detected asteroids through a belt-like region on Earth's atmosphere. In principle, almost an entire area of earth's atmosphere could be covered with trivial displacement

Publication

[1] Pranava Seth, **Pratyay Chowdhury**, others, "SPACE-SUIT: An Artificial Intelligence based chromospheric feature extractor and classifier for SUIT" *arXiv*, DOI: <https://doi.org/10.48550/arXiv.2412.08589>.

Member

Dec 2013 - Now	Sky Watchers Association of North Bengal, India <i>It is an amateur astronomy organization based at Siliguri, the city at foothills in the northern part of West Bengal state of India. together we do our Own study, regular sky-watching and astrophotography. Special celestial event-based projects. Popularisation of astronomy-. through presentations and sky-watching events.</i>
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Skills and Proficiency

Languages	Native language Bengali. Fluent in English and Hindi. Familiar with Nepali.
Programming Languages	Proficient in Python. Familiar with C++.
Other Skills	Event Management, Cricket, Table-tennis etc.

Interests

Academic	Astro-particle Physics, Dark Matter and Dark Energy, Particle Physics, Quantum Foundation, Cosmology.
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Non-Academic	Film, Music, Photography, Travel etc.
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Achievements

2018	Represented India in the International Asteroid Search Campaign, organized by the International Asteroid Search Collaboration, I discovered an asteroid during this campaign.
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